APPENDIX A
DETAILS OF PIT PRODUCTION PROCESS AND REQUIREMENTS

A.1 FACILITY SUMMARY

A Modern Pit Facility (MPF) would be capable of producing certified pits for the U.S. Nuclear Weapons Stockpile as defined by the National Nuclear Security Administration. The scope of the facility being planned would be as follows.

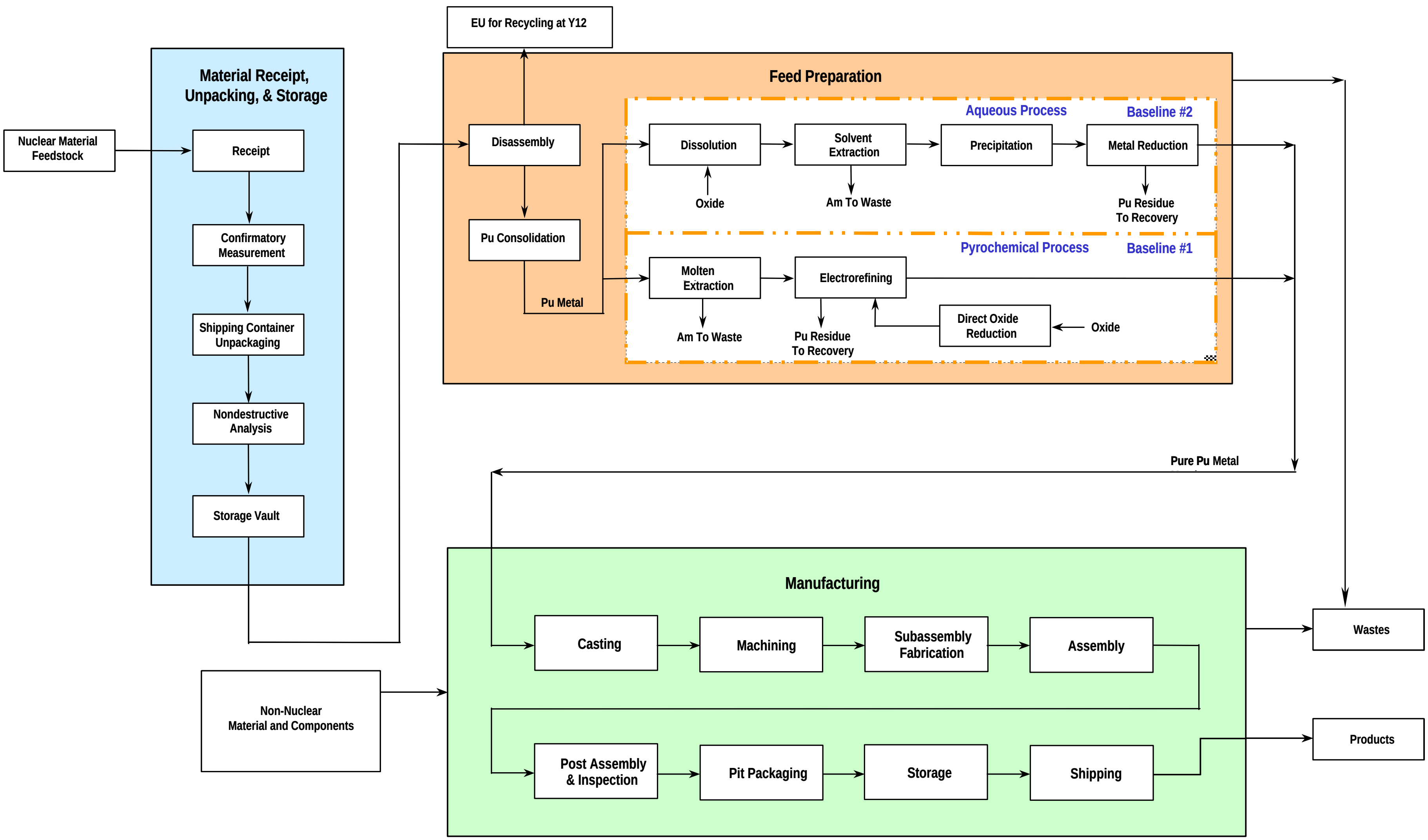
- MPF would be a newly constructed facility that provides long-term (past 2015) plutonium pit manufacturing capability.
- MPF would be designed with the goal of developing a safe, secure, and environmentally compliant facility based on modern manufacturing practices.
- MPF would be located at an existing DOE site and integrated, as appropriate, with other present and planned facilities at that site.
- MPF would be supported by one or more additional plutonium-capable facilities. Other plutonium facilities at Los Alamos National Laboratory or Lawrence Livermore National Laboratory are assumed to be available for complementary Research and Development or backup operations.
- MPF would be an integral part of a broader weapons production complex. It is assumed that existing production facilities now manufacturing some pit components (non-plutonium parts) would continue to be suppliers in the future.
- MPF would be capable of single-shift capacity of no less than 125, 250, or 450 pits per year (ppy) and surge capacity through the use of multiple shifts.
- MPF would be capable of manufacturing plutonium components and assembling all full pits (of current or new design) in the enduring stockpile. A full pit is defined as the complete assembly to be received by the Pantex Plant (Pantex) for incorporation into an operational weapon.

A.2 FACILITY OPERATIONS

Processing operations in the MPF plant would include the following major categories: Material Receipt, Unpacking, & Storage; Feed Preparation; and Manufacturing. Figure A.2–1 provides an overview of the MPF process.

A.2.1 Material Receipt, Unpacking & Storage

Plutonium feedstock material would be delivered from offsite sources in U.S. Department of Energy (DOE)/Department of Transportation-approved shipping containers. The shipping containers may be held in Cargo Restraint Transporters (CRT) and hauled by Safe Secure Trailers or Safeguards Transporters. The CRTs would be unloaded from the truck and the shipping packages unpacked from the CRT. Each shipment would be measured to confirm the plutonium content, entered into the facility's Material Control & Accountability database, and placed into temporary storage. The shipping packages would later be removed from storage and



Source: Modified from NNSA 2002.

Figure A.2–1. Modern Pit Facility Process Flow

opened to remove the inner containment vessel. The containment vessels with the feedstock material would be accountability measured and then transferred to the Receipt Storage Vault pending transfer to the Pit Disassembly and Feed Preparation Area. In addition to the pits, many other components from throughout the Nuclear Weapons Complex would be shipped to the MPF. These interfaces are shown graphically in Figure A.2.1–1.

A.2.2 Feed Preparation

The containers would then be transferred through a secure transfer corridor to an adjacent Feed Preparation Facility where site return pits would be disassembled and the recovered plutonium would then be purified using either an aqueous or a pyrochemical process.

A.2.2.1 Disassembly

In the Disassembly process, pits will first be removed from the primary containment vessels. The mechanical disassembly of the pits would involve cutting the pit in half and removing all non-plutonium components. The non-plutonium components would then be declassified, packaged, and assayed prior to removal from the facility as waste or recyclable material. The plutonium components, including non-plutonium items containing residual plutonium that could not be removed mechanically from the pit, would be transferred to the Plutonium Recovery and Purification Area.

Uranium components that could be mechanically separated would be decontaminated to remove any residual plutonium prior to packaging for shipment. The decontamination would be accomplished electrochemically. The residues from this process could be dried and disposed as waste, or re-dissolved if plutonium recovery would be desired.

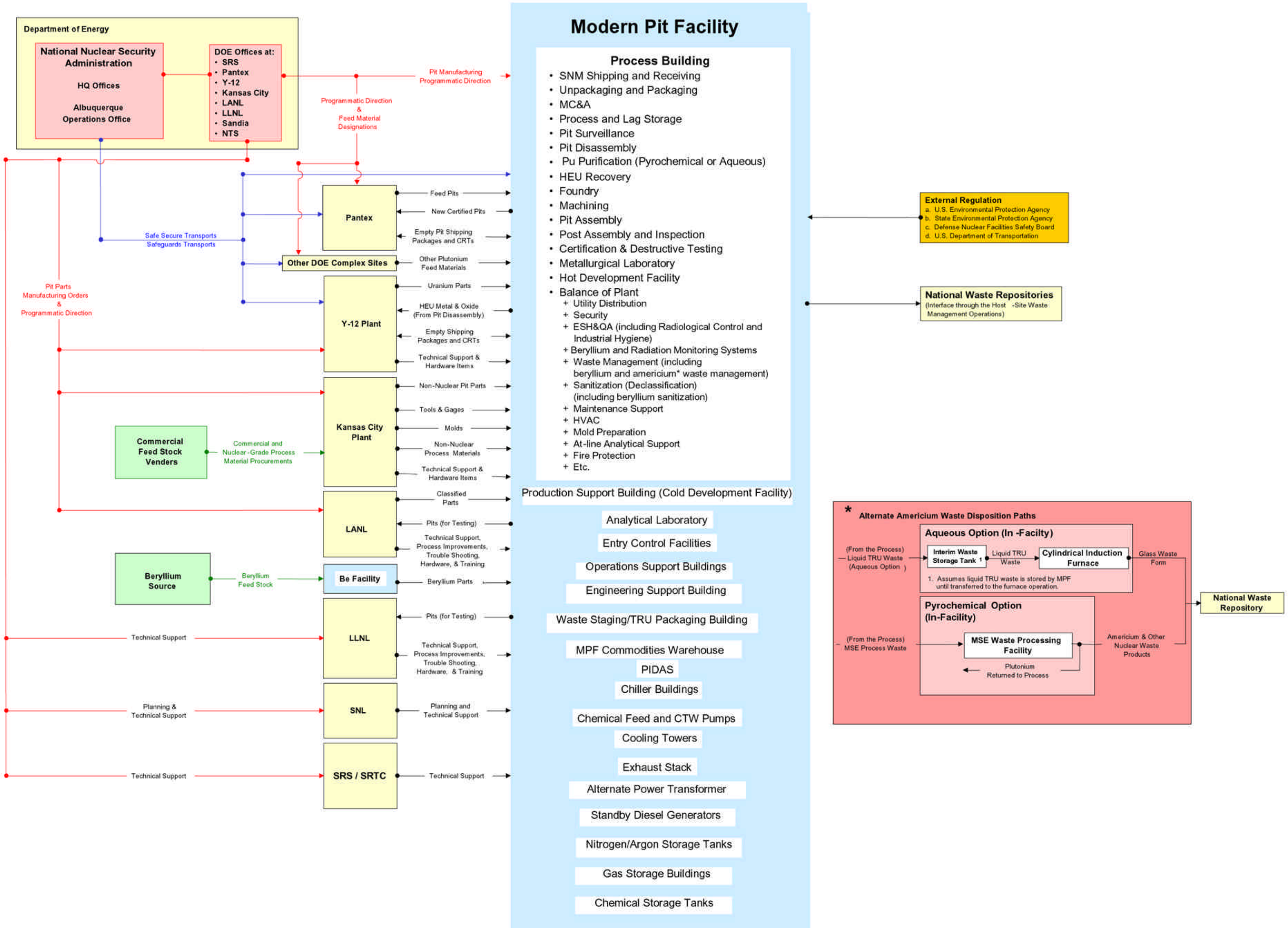
A.2.2.2 Plutonium Consolidation

Plutonium pieces would be charged to a casting furnace for conversion to a metal ingot. The metal ingot would then be transferred to the purification process.

A.2.2.3 Plutonium Purification

There are two baseline processes being evaluated for the purification of the plutonium metal. One baseline relies more heavily on aqueous chemistry (aqueous process) and the other on pyrochemical reactions (pyrochemical process). The primary difference between the two baselines is that the aqueous process does not employ chloride containing aqueous solutions which means conventional stainless steels can readily be used to contain all of its processes. On the other hand the pyrochemical process requires specialized materials to contain the corrosive chloride bearing solutions that it employs.

The primary process evaluated in this EIS is the aqueous process. This is a well-known process that has been successfully used at DOE sites for many years. It is comparatively simple and experiences few, well controlled corrosion problems. However, it is not as space efficient and does not produce as pure a product metal as the pyrochemical process. This lower purity



Source: NNSA 2002.

Figure A.2.1–1. Modern Pit Facility Interface with the Nuclear Weapons Complex

requires more complete processing and historically produces a great deal more waste. This provides a bounding analysis of the waste impact from the MPF. Residue from the aqueous process would be packaged, assayed, and sent to storage for recovery of plutonium during scrap recovery campaigns. If the plutonium content was acceptably low, this material could alternatively be packaged for disposal as waste.

The pyrochemical process is more complex than the aqueous process, employing seven versus four major processing steps. However, this can be done in less space with more processing flexibility. It also produces very pure metal and a lower volume of waste. The purity of metal allows the pyrochemical process to have the option of only partially processing metallic plutonium to obtain adequate production purity. Although it requires special materials of construction to contain the corrosive chloride solutions it appears to have the greatest potential for improvement based on the number and type of proposed development projects. Residue from the pyrochemical process would be packaged, assayed, and sent to storage for recovery of plutonium during scrap recovery campaigns. If the plutonium content was acceptably low, this material could alternatively be packaged for disposal as waste.

The pyrochemical process is being investigated because it has the potential to be environmentally more benign, thus having less environmental impact than the aqueous process. The impacts from both of these processes will therefore be bounded in this EIS. As the design of the MPF develops and a final purification method is chosen, the follow-on EIS will evaluate the impact of the actual process to be used.

A.2.3 Manufacturing

Plutonium metal from the recovery and purification processes would be used to fabricate new pits. Some plutonium metal from other sources could be used to supplement the plutonium recovered from the purification operations. The plutonium metal would then be transferred to the manufacturing area where it would be melted and cast into required shapes in a foundry operation. These castings would then be machined to proper dimensions, combined with other non-plutonium parts including beryllium and enriched uranium components and would be assembled into pits. Throughout the manufacturing operations, certification and inspection would be conducted to ensure that components meet specifications. The finished pits would then be prepared for storage and eventual shipment.

Residues from the manufacturing process would be recycled either to the melting/casting operation or sent back to the plutonium purification process to recycle the plutonium back through the entire process. Wastes from this process would be packaged, assayed, and sent to storage for recovery of plutonium during scrap recovery campaigns. If the plutonium content was acceptably low, this material could alternatively be packaged for disposal as waste.

A.3 FACILITY REQUIREMENTS

The design size of a MPF will be primarily affected by both the operational lifetime of pits and the size of the stockpile. Since there is uncertainty over both these issues, the final design size of a MPF has not yet been determined. These uncertainties have been evaluated in classified studies. Three levels of production are evaluated to provide a reasonable range for analysis in this MPF EIS. These are 125, 250, and 450 ppy in a single-shift operation. To accommodate these three production rates, this MPF EIS analyzes three different plant sizes. Another consideration is the contingency or surge use of two-shift operations for emergencies. The surge outputs of the 125 and 250 ppy plants would thus be approximately the same and have the same environmental impact as the 250 and 450 ppy single-shift scenarios. The impacts of surge output of the 450 ppy plant were evaluated in a qualitative manner for each resource.

A.3.1 Security

The majority of the facilities of a MPF would be located within a Perimeter Intrusion Detection and Assessment System (PIDAS). The PIDAS would be a multiple sensor system within a 9-m (30-ft) wide zone enclosed by two fences that runs around the entire Security Protection Area. In addition, there would be 6-m (20-ft) clear zones on either side of the PIDAS. There would be an Entry Control Facility at the entrance to the Security Protection Area.

A.3.2 Process Structures

The proposed concept being evaluated for a MPF divides the major plant components into three separate process buildings identified as Material Receipt, Unpacking & Storage, Feed Preparation, and Manufacturing that provide the services described in Chapter 3, Section 3.1.1. The process buildings would be two-story reinforced concrete structures located aboveground at grade. The exterior walls and roof would be designed to resist all credible man-made and natural phenomena hazards and comply with security requirements. The exterior walls of the first level would consist of a double reinforced concrete wall construction with loose aggregate backfill between the walls to satisfy security requirements.

The first level of each process building would include plutonium processing areas, manufacturing support areas, waste handling, control rooms, and support facilities for operations personnel. The second level of each of the three process buildings would include the heating, ventilation, and air conditioning (HVAC) supply fans, exhaust fans and high-efficiency particulate air filters, breathing/plant/instrument air compressor rooms, electrical rooms, process support equipment rooms, and miscellaneous support space. Interior walls would be typically reinforced concrete to provide personnel shielding and for durability in the 50-year facility design life. Each of these processing buildings would have its own Entry Control Facility, Truck Loading Docks, Operations Support Facility, and Safe Havens designed in accordance with applicable safety and security requirements. The three processing buildings would be connected with secure transfer corridors.

A.3.3 Support Structures Within the Perimeter Intrusion Detection and Assessment System

The major buildings located within the PIDAS would include the Analytical Support Building and the Production Support Building. The Analytical Support Building would contain laboratory equipment and instrumentation required to provide analytical support for the MPF processes, including radiological analyses. The Production Support Building would provide the capability for performing nonradiological classified work related to the development, testing, and troubleshooting of MPF processes and equipment during operations. A number of other smaller structures also supporting the MPF would include standby generator buildings, fuel and liquid gas storage tanks, HVAC chiller buildings, cooling towers, and the HVAC exhaust stack.

A.3.4 Support Structures Outside the Perimeter Intrusion Detection and Assessment System

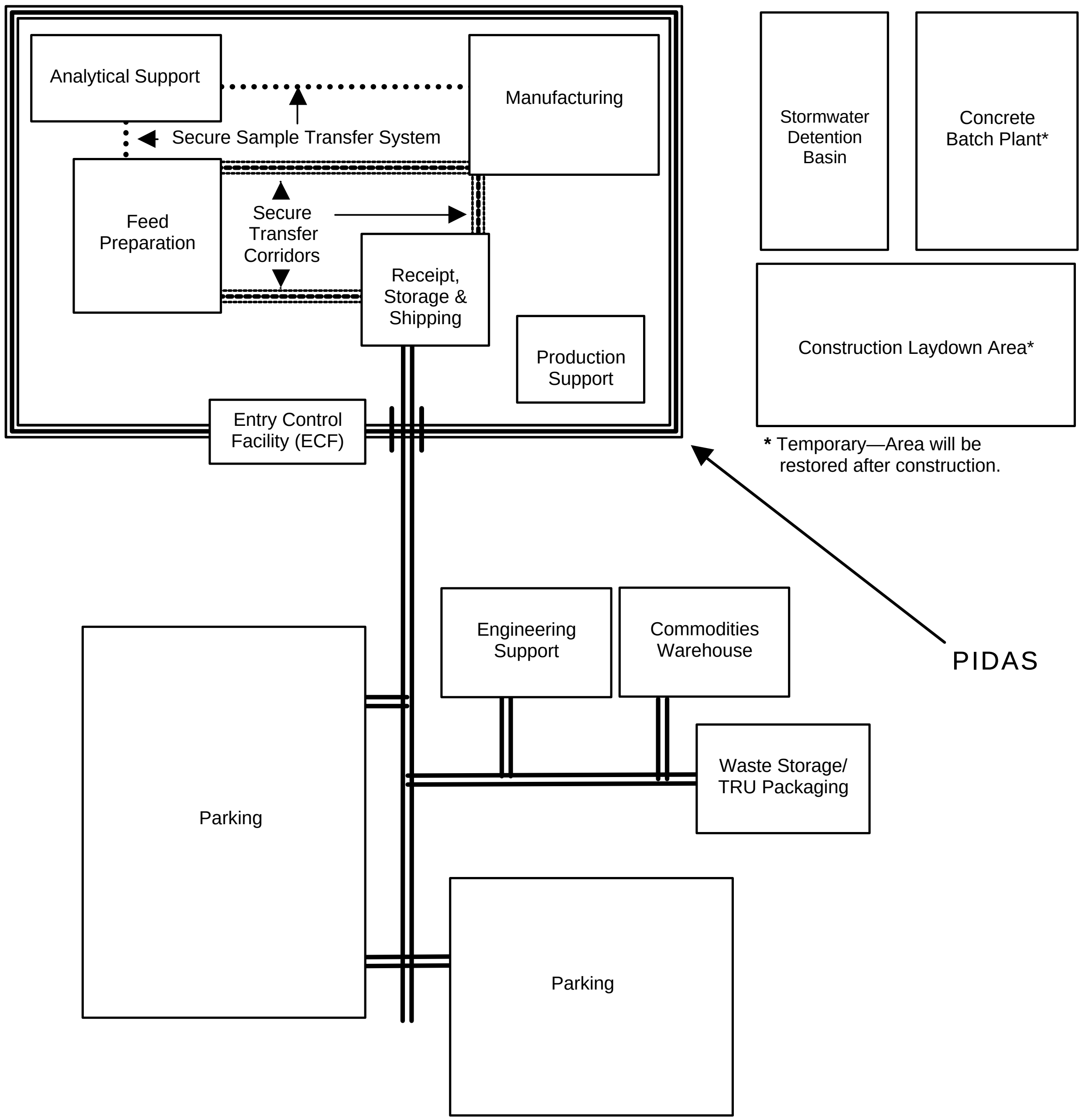
The major structures located outside the PIDAS would include the Engineering Support Building, the Commodities Warehouse, and the Waste Staging/TRU Packaging Building. This Waste Staging/TRU Packaging Building would be used for characterizing and certifying the TRU waste prior to packing and short-term lag storage prior to shipment to the TRU waste disposal site. Parking areas and stormwater detention basins would also be located outside the PIDAS. In addition, a temporary Concrete Batch Plant and Construction Laydown Area would be required during construction.

A generic layout showing the major structures and their relationship to each other is shown in Figure A.3.4–1. Table A.3.4–1 shows the dimensions involved with each of the plant capacities.

Table A.3.4–1. Dimensions for the Three Different MPF Capacities

	125 ppy	250 ppy	450 ppy
Processing Facilities Footprint (m^2)	28,600	32,800	44,900
Support Facilities Footprint (m^2)	26,000	26,200	29,900
Total Facilities Footprint (m^2)	54,600	59,000	74,800
Total Facilities Footprint (ha)	5.46	5.90	7.48
Area inside PIDAS (ha)	25.5	26.3	31.6
Area Developed During Construction (ha)	56.3	58.3	69.2
Post Construction Developed Area (ha)	44.5	46.5	55.8

Source: MPF Data 2003.



Source: Modified from MPF Data 2003.

Figure A.3.4–1. Generic Layout of the Modern Pit Facility